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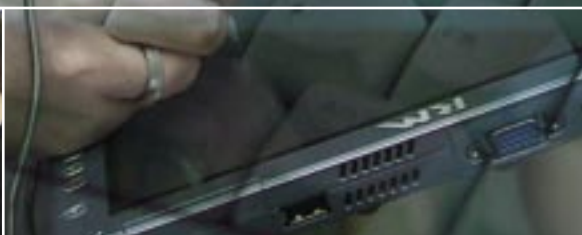
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The Impact of Broadband in Schools

Summary report

Jean Underwood, Alison Ault, Phil Banyard, Karen Bird,
Gayle Dillon, Mary Hayes, Ian Selwood, Bridget Somekh
and Peter Twining



Foreword



Broadband connectivity is a central component of Becta's vision for a coherent, dependable and sustainable ICT architecture for education, connecting schools to a wide range of content, services, applications and institutions. In this way, broadband connectivity will support teaching and learning and facilitate easy access to, and exchange of, management and administrative data.

Becta's vision builds on work to date to develop a National Education Network (NEN), linking existing broadband infrastructure to create a national network that provides safe information and service access across education. The NEN is key to the provision of a common digital infrastructure for education – a system that unifies local, regional and national structures, providing the right technical infrastructure – as set out in the DfES' e-Strategy, *Harnessing Technology: Transforming Learning and Children's Services*, in March 2005 [<http://www.dfes.gov.uk/publications/e-strategy/>].

Although the NEN is still in development, significant progress has already been made. An important step was the initial funding for Regional Broadband Consortia (RBC) to provide safe, secure and fast managed broadband services to schools through dedicated networks – national policy with regional delivery. Further progress was made when all ten RBC networks were connected together via superJANET4 – the Joint Academic Network (JANET) backbone linking all further and higher education institutions and the research councils. Work is now under way to agree and embed a standards framework to underpin the future development of the NEN, to ensure that the already significant return on the sector's investment in broadband is maximised.

Much has been achieved: as of June 2005, 81 per cent of maintained schools in England had a broadband connection (78 per cent of primary and 99 per cent of secondary schools). These figures are rising as RBC and LEA broadband deployments continue apace.

This report underlines the crucial importance and impact of this investment, and clearly demonstrates the benefits and advantages that broadband connections can bring to schools. Of particular importance is the impact that reliable, high-performance broadband connectivity has in embedding the use of ICT within institutions, raising confidence, competence and capability. Broadband is changing the way pupils learn and construct their work, changing the way teachers organise their lessons and co-operate with one another, and changing the ways schools administer the curriculum. As a catalyst for curriculum change, broadband has widened and deepened participation in learning. As the 2006 target is reached, we believe that broadband will continue to enable a more timely and effective realisation of the benefits which flow from the embedding of ICT in education.

A handwritten signature in dark ink, appearing to read 'Stephen Lucey', with a horizontal line drawn underneath.

Stephen Lucey
Executive Director

Summary of findings

This report is a review of our current state of knowledge of the impact of broadband technologies on the educational process. It was commissioned by the British Educational Communications and Technology Agency (Becta) and is the second in the series of reports on the impact of broadband.

In the initial pilot project we drew on largely qualitative evidence from a small sample of self-selecting schools (Underwood et al., 2004). These schools were deemed to be best-practice schools and the goal of the study was to identify what could be achieved in a broadband-enhanced learning environment. The evidence of broadband connectivity being exploited to the full through activities such as video conferencing and through online interactions in which pupils acted as both receivers and also creators of knowledge, was impressive.

This second study explores the degree to which such activities have spread to more typical schools. It is based on sources of information such as quantitative data of broadband usage drawn from Regional Broadband Consortia (RBC) and Local Education Authorities as well as data from a more representative sample of schools. Where possible, we investigated the impact of broadband on standard performance data as well as surveying staff and interviewing headteachers within the school. We also conducted a limited number of individual school case studies.

In this second, more representative, sample there were fewer instances of activities that are broadband dependent: for example, the use of video conferencing was in its infancy. This is partly explained by the fact that many of the schools were in the first year of working with the increased level of connectivity and were yet to understand its potential. However, a second and equally interesting finding emerged, and this concerned the embedding of the technology into classrooms. Throughout this and the pilot project, teaching and support staff and pupils have commented on the increased reliability and capacity of a broadband-supported classroom. These two characteristics jointly increase both the quality and quantity of educational activities that can be, and are, being undertaken. Such reliability has led to increased confidence in the technology for all users and in turn to widening and deepening of participation as multiple users can be connected at any one time without adversely affecting speed of access. In essence, a broadband level connectivity allows technology to become embedded throughout a school, and leads to significant efficiency gains and interesting changes in the working practices of both staff and pupils.

However, while the potential is there, as witnessed by the rich sources of data presented here, assessment may limit that function. Technologies present challenges to the current assessment system. How should we assess the new skills that are developing and what implications has the prominence of such new skills for more traditional educational goals? So far, the assessment system remains stubbornly resistant to change. In this study, it was one of the few areas of educational activity that showed only a marginal impact of the technology.

Whilst this study provides evidence that much progress has been made, with positive developments across age phase, subject and types of activity since our pilot evaluation report, there remain barriers to effective broadband usage and also growing concerns about the sustainability of the infrastructure underpinning its successful use. Some barriers were reported in the pilot study and new barriers have also been identified in the current study. The issue of filtering internet access, which was problematic for many schools in the pilot project, has decreased as schools learn ways to improve the filtering process.

“The cost of broadband and the supporting technologies remains a concern for many schools. Equally, the cost of providing the increased technical support needed to sustain technologically rich environments is still a worry for many schools, and primary schools in particular.”

Schools are required to make decisions about resource allocation that challenge their understanding of the technology and its possibilities. As a result there is some redundancy in the purchase of software titles and the adoption of some short-term approaches in the design of networks.

A summary of outcomes is listed on the pages following – full details can be found in the main report [www.becta.org.uk/research].

“ICT in general – and broadband technologies in particular – are increasingly seen as a catalyst for curriculum change.”

Variations in provision in level of broadband connectivity

The implementation of the Broadband Stakeholder Group's (BSG, 2001) educational broadband connectivity plan to have wired educational institutions by the end of 2006 appears to be proceeding well. There are, however, regional variations in provision. Some RBCs have already achieved a 10 Mbps level of connectivity across the educational spectrum, while others are staging implementation, first connecting at 2 Mbps but with a future goal of 10 Mbps. Again there may or may not be variations between primary and secondary provision depending on the RBC.

It would be over-simplistic to say that these variations result from ease of implementation in geographically small but populous areas. While these factors are important, the level of connectivity is also dependent on each RBC's policy rather than on simple geographic factors such as the rural or urban divide.

Broadband connectivity – meeting the need

The majority, but not all, of the primary schools in this sample are operating within the 'threshold of comfort', that is, the level of connectivity is adequate to their needs. Those primary schools testing the limits of provision are too few to establish any pattern or influencing factors.

However, 40 per cent of secondary schools are regularly operating beyond the 'threshold of comfort'. For secondary schools this is most acute when the school has 2 Mbps connectivity. It is also more acute in urban areas than rural ones.

Low use of the resource is not prevalent but where it does occur it is a feature of the primary age phase, often with new recipients of the technology, or of schools with above recommended levels of connectivity.

Links between the level of broadband activity and nationally accessible performance data

At GCSE, significant differences were evident in pupils' performance on GCSE/GNVQ tests, with significantly improved performances in the year immediately following the installation of broadband. This finding should be treated with caution due to small sample size.

No significant effects on nationally accessible performance data were found at Key Stage 2.

Aspects of broadband connectivity and the school environment that contribute to better outcomes for pupils and teachers

The ICT skills base for both staff and pupils continues to improve and competence and confidence in ICT usage is increasingly pervasive throughout the schools. Lessons designed to specifically teach ICT skills are featuring less on school timetables and learning through use is becoming the norm.

"The level of management commitment to the technology is a major factor in the acceptance of ICT in the whole school."

For secondary schools, higher levels of connectivity (a minimum of 2 Mbps with caching or circa 10 Mbps) enable a whole year group to conduct internet research simultaneously and with minimal delay.

Schools with the highest levels of connectivity made more use of their broadband connection for administrative purposes.

While both primary and secondary teachers use this technology in equal measure to support teaching and preparation and, to a lesser extent, professional development, secondary teachers were more active users of the technology for administration.

Features associated with broadband connectivity that hinder effective use

The problem of accessing ICT resources within the institution and at home is declining for staff. For pupils, in-school access is now generally good although resourcing home-school links remains an issue despite positive action by some schools to make resources more universally available. The conundrum here is that although resources in the home are increasing, the quality of those resources is not always sufficient to meet increased demands, such as using the school's VLE.

The issue of filtering internet access raised in the pilot project has decreased as schools implement ways to improve the filtering process. For example, some schools have installed their own internal filters to supplement that provided with their internet connection.

There is a growing concern about the sustainability of the infrastructure. The cost of broadband, its supporting technologies and technical support is a worry for many schools. This is particularly so for primaries.

Academic and motivational benefits associated with educational uses of this technology

The nature of teaching and learning

The enabling nature of the technology allows seemingly prosaic use to encourage the development of high-level thinking skills in the hands of a creative teacher. Broadband technology increases the quantity, quality and efficiency of resource access, not only freeing time but providing a richer set of materials for learning activities.

The ability to tailor learning packages to individual pupils by provision of various learning tasks within the same classroom is being realised by many teachers.

“Multimedia and interactive content is engaging and motivating, particularly for primary pupils.”

Use of such material in primary and secondary institutions adds variation to lessons and helps to keep pupils focused by seamless transition from ICT to non-ICT activity, and from website to website.

For many secondary schools broadband is enhancing learning by being an additional tool to aid research. A number of case studies and the questionnaire responses record enthusiasm of both staff and pupils for activities that use the technology. Cessation of such activities is viewed as a punishment by both staff and pupils.

Changes in working practice

There is increasing ICT activity for teaching and learning and for support administration. In secondary schools ICT is starting to branch out from the core subjects, although a small but significant percentage of interviewees felt that the core curriculum subjects still had first access to the ICT facilities.

Many teachers express awareness of resources available, and are gaining confidence to explore possibilities that such a rich resource base offers.

Some schools are beginning to share both technical and pedagogical provision and practices externally as well as internally.

Pupils are turning increasingly to electronic production, storage and communication of their work.

“The formal school day no longer acts as the main constraint on teaching and learning activities.”

Where good digital home-school links have been established, pupils and teachers are able to operate within a single virtual space irrespective of their geographic location.

Aspects of increased connectivity that contribute to better outcomes for students and teachers

As recorded in the pilot project, the main advantage of broadband over previous internet connections is that it provides faster and more stable access to learning materials, and for many pupils at the same time.

The reliability of broadband has been associated with new emerging ways of communicating including everyday administration between staff but also between staff and pupils; sharing of expertise and knowledge within and between schools; and communicating with the home and the community which is currently limited but a growing feature in many of the schools surveyed here.

“It also provides access to countless lesson ideas and materials to aid teachers in their planning, which reduces time spent on initial preparation whilst increasing time available for developing and sharing ideas with colleagues.”

The educational ‘industry’ has been very responsive to the opportunities presented by the technology, as is shown by the growth in use of subscription sites for which schools utilise their e-learning credits to gain access.

Equally, there are numerous free access websites with educational content that schools consider valuable and often use in lessons.

Non-technological barriers to change

While assessment in some schools is being mediated through the new technologies, the nature of assessment, whether online or using more traditional technologies, remains unsurprisingly resistant to change. National assessment criteria are the driving force here and only through change at this level will the potential of digital technologies as assessment tools be realised.

A small number of primary schools are still concerned that secondary schools will not have the same level of ICT activity incorporated into the curriculum that the young pupils are becoming accustomed to. This has been a long-term concern but the data collected here shows that this is a declining issue.

Cost is a significant non-technological barrier highlighted by many schools as they plan for future ICT provision in general and broadband in particular.



Recommendations

In this project we anticipated that the RBCs would be the source of a rich vein of data. This has proved to be so but the disparate nature of the data collected has been problematic. A co-ordinating organisation needs to be established to collate and manage data from the RBCs to provide a national and regional picture of the level of usage of the broadband connectivity.

Level of connectivity

A technical assessment of the effectiveness of different combinations of connectivity level and caching to support a range of future learning environments needs to be undertaken. The size of the school, type of use and type and amount of technology connecting to the internet all need to be taken into consideration when assessing any school's broadband resource needs. In addition, the pedagogic and learning models – for example, whether the school perceives the learner as just an information receiver or as information receiver and provider – will have implications for resource usage.

From these analyses Becta should be encouraged to produce scenarios for relevant stakeholders, which show what they might achieve with different levels and configurations of this enhancing technology. This would allow schools and LEAs to commit to broadband at an appropriate level.

Agendas for provision

There were many differences between the service provision and support in both LEAs and RBCs, including the level of connectivity being installed in schools. A systematic study of this issue was not in the remit of the current study, but it is an area worthy of further research.

Quality resources, e-learning credits and CPD

A re-evaluation of e-learning credits was called for by many schools, and in two main ways. Staff called for provision or means of increasing awareness of new software to allow them to utilise the credits in their currently intended way. Conversely, some staff felt that they now had sufficient software for their needs, and so stated that new ways to spend the credits would be most beneficial, such as in ICT-specific training to enable them to make better use of the resources they currently have.

Patterns of response to the technology

The causes of any differential response to the technology need further exploration. Does use of broadband need to be compatible with existing practices, or does it engender new practices?

Pupil response and the use of broadband

The focus for study should now be on how styles of working and modes of thinking are changing in a generation of learners brought up in technological environments. As we examine the way technology affects the way they think and communicate, we should ask ourselves what assessments we should be devising to capture these new cognitive and social skills.

Whose information?

In some schools we are seeing a move from the pupil as information receiver to pupil as author or creator of information, now that they have been provided with the tools to operate in this role. To what extent is the pupil being given/taking responsibility, ownership and autonomy for his/her own learning?

There needs to be a review of teacher and pupil understanding of, and attitudes to, issues surrounding the nature of information. This includes an evaluation of the quality of information and information sources. This in turn relates to staff and pupils' understanding of, and attitudes towards, intellectual property rights.

Further information

A PDF of this summary, and PDFs of the report on which it is based, can be downloaded from the Becta Research website - as can supporting data in the form of tables of correlation between Ofsted grades and QCA attainment data.

The complete findings about the relationship between ICT resources and school standards, published as part of the DfES/Becta research and evaluation series, are also available from the Becta Research website.

<http://www.becta.org.uk/research/reports/ictresources.cfm>

www.becta.org.uk/research



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